UNITED STATES RESEARCH SURVEYS CONDUCTED IN 1991 AND SURVEYS PLANNED FOR 1992 IN THE BERING SEA

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The first synoptic survey of the overall Bering Sea was planned for the summer of 1991 by the United States, Japan, and the Soviet Union. One of the main purposes of this survey was to obtain a biomass estimate for pollock throughout the Bering Sea which could be used to derive an appropriate harvest level for pollock over all regions of the Bering Sea. The planned survey had several elements: (1) a U.S. bottom trawl and echo integration-midwater trawl (EIMWT) survey of the eastern Bering Sea continental shelf and slope, (2) a bottom trawl survey of the eastern and western Bering Sea shelf by a Soviet vessel, (3) a bottom trawl survey of the Aleutian Islands region by two U.S. vessels, (4) an EIMWT survey of the Aleutian Basin east of the U.S.-U.S.S.R. convention line, including international waters, by a Japanese vessel, and (5) an EIMWT survey of the western Aleutian Basin and western Bering Sea shelf conducted by U.S. and Soviet personnel aboard a U.S.S.R. research vessel, and using a U.S. echo integration system. The goal of the overall Bering Sea survey was not completely achieved because the EIMWT survey of the western Aleutian Basin and western Bering Sea shelf could not be arranged. Nevertheless, the 1991 cooperative effort will provide data on the distribution and abundance of the many species of groundfish and crab over a major portion of the Bering Sea in the same time period.

I. Research activities in the Bering Sea related to the overall Bering Sea survey and other studies during 1991 are described below.

(A) Echo integration-midwater trawl survey

The United States conducted a two part echo integration-midwater trawl survey of walleye pollock in the eastern Bering Sea during 1991. The primary objectives of this survey were to:

1. collect echo integrator and midwater trawl data to determine the distribution, abundance, and biological composition of walleye pollock;
2. calibrate the towed body and hull-mounted acoustic systems using standard sphere technique;

3. collect pollock target strength data for use in scaling echo integration data to estimates of absolute abundance;

4. collect ichthyoplankton samples to determine the distribution and abundance of pollock eggs and;

5. conduct calibrations of acoustic systems between U.S. and Japanese survey vessels.

The first portion of the survey was conducted in the eastern Bering Sea aboard the NOAA Research Vessel Miller Freeman during February-March, 1991. Survey operations were initiated along 7 parallel transects placed approximately 30 miles apart from Umnak Island to west of St. George Island. Bottom depths ranged from 80 m to 550 m. A total of 12 midwater tows and three bottom trawls were conducted to sample echo sign and collect biological data. A total of 20 bongo hauls were made throughout the survey area.

Spawning pollock concentrations were also surveyed in the Bogoslof Island region. Parallel transects were established approximately 10 miles apart running north to south between 170° W longitude and 167° W longitude. The Miller Freeman made 3 EIMWT passes through this area.

The U.S. chartered fishing vessel Continuity conducted the second portion of the echo integration/midwater survey of walleye pollock on the continental shelf of the eastern Bering Sea during June-August. The primary region surveyed included waters between 162° W and 179° W and south of 62° N as shown in Figure 1.

In addition to pollock density information, size composition, individual total weight, age, maturity, gonad weight, and stomach content data were collected. Pollock tissue samples were collected and preserved for subsequent stock structure studies. Environmental data such as water temperature and salinity profiles were recorded. The Japanese fishing vessel Shoyo maru participated with the Continuity during intercalibration experiments.

(B) Eastern Bering Sea triennial crab-groundfish survey

The eastern Bering Sea crab-groundfish survey was conducted during May-August 1990 utilizing standard crab-groundfish survey methods. This comprehensive triennial survey extended the standard annual eastern Bering Sea shelf survey north to Norton
Sound and into continental slope waters. This was a cooperative bottom trawl survey with the U.S.S.R. Pacific Institute of Fisheries and Oceanography. The Primary objectives of this survey were to:

1. collect catch and biological information on principal species of crab and groundfish to provide information for management purposes, the fishing industry, and for scientific studies;

2. conduct an exploratory survey of juvenile fish and crab;

3. collect hydrographic and environmental data.

Secondary objectives were to:

1. collect information on yellowfin sole spawning areas in Togiak Bay and Kuskokwim Bay;

2. collect trawl configuration and performance data to use in area swept analysis and;

3. collect yellowfin sole maturity data to determine the timing and areas of spawning.

The eastern Bering Sea survey area included continental shelf and slope waters from Unimak Pass, along the 800 meter depth contour to approximately 60° N, north along the U.S.-U.S.S.R. Convention Line to St. Lawrence Island and east to the Alaska mainland. Sampling sites were also established in the Norton Sound region.

Continental shelf: Survey activities in the shelf area were coordinated between two U.S. vessels, the University of Washington research vessel Alaska the chartered U.S. fishing vessel Ocean Hope 3, and the Soviet Union vessel Novodrutsk. The Alaska and Ocean Hope 3 sampled U.S. shelf stations with the vessels fishing alternate rows of designated stations during June-August to facilitate the determination of relative fishing efficiencies of the two vessels. The Novodrutsk began its portion of the survey in early May, several weeks earlier than the U.S. vessels, and sampled alternate rows of stations throughout the U.S. shelf survey area sampled later by the U.S. vessels. The Novodrutsk continued to sample shelf waters west of the Convention line to 58° 30'N along the Soviet coast.

The Alaska and Ocean Hope 3 successfully completed 505 bottom trawls in the eastern Bering Sea area (Figure 2). The Ocean Hope 3 sampled an additional 52 stations in Norton Sound and the Alaska conducted 77 beam trawls in the area between Port
Moller and Kvichak Bay to collect information on juvenile fish and crab. The Novodrnetsk completed a total of 218 trawls in the eastern and western Bering Sea as shown in Figure 3. Time limitations and ice conditions prevented the Novodrnetsk from sampling scheduled stations in the northern Bering Sea area.

The catch at each sampling site was sorted, weighed, and enumerated by species. Length and width measurements, shell conditions, clutch size, and various tissue and organ samples were collected from major crab species. The two U.S. vessels recorded nearly 170,000 length measurements by sex/centimeter interval from the major fish species and collected approximately 4,300 age structures. Nearly 7,200 stomachs were collected from various fish taxa for food habit analysis. Individual lengthweights were also recorded for pollock.

Sea water temperature profiles were collected at each station using expendable bathythermograph (XBT) probes. Net mensuration systems provided gear configuration and performance data to be used in area swept calculations.

Continental slope: The Miller Freeman conducted the slope portion of the survey in September. Survey stations were sampled along the continental slope from the U.S.-U.S.S.R. Convention Line to Unimak pass at depths ranging from 200 m to 800 m. A Nor'eastern bottom trawl with roller gear was the standard sampling net used at all stations. All catches were sorted, weighed, and enumerated by species. Size composition by sex, otolith samples, and other biological information were collected. A total of 90 bottom trawls were successfully completed (Figure 2). Nearly 20,000 fish length measurements were recorded and about 350 stomachs were preserved for food habit studies. Over 900 otoliths were collected from 6 fish species for aging studies.

(C) Aleutian Islands bottom trawl survey.

The United States conducted a bottom trawl survey in the Aleutian Islands region during July-September, 1991. The survey area included Bering Sea waters on the north side of Unalaska and Unmak Islands to the Islands of Four Mountains and extended on both sides of the Aleutian chain to Stalemate Bank (170ø E). Survey activities were conducted by the chartered fishing vessels Green Hope and Ocean Hope.

A total of 379 bottom trawls were conducted during this survey. The catch at each sampling site was sorted by species and sampled for biological information including size and age composition, individual weight, and maturity. Over 1,800 stomachs from 13 fish species were collected for feeding habit studies.

(A) Bogoslof Island Winter EIMWT Survey

The United States will conduct a 10 day EIMWT survey of spawning pollock in the Bogoslof Island region. Survey activities will be conducted aboard the Miller Freeman during February-March 1992. Surveys in this area were also conducted during 1988, 1989, and 1991.

(B) Eastern Bering Sea Crab-Groundfish Survey

The standard eastern Bering Sea bottom trawl survey will be conducted during May-August, 1992. This is a continuation of the annual series of eastern Bering Sea crab-groundfish assessment surveys. The primary objectives of this survey are to:

1. study annual and long-term changes in the demersal fish and invertebrate communities of the eastern Bering Sea shelf and slope;

2. measure selected oceanographic parameters which may affect the abundance and distribution of these populations.

The survey area will extend north from Unimak Pass along the 200 m depth contour to approximately 62° N and east to the Alaska mainland. It is anticipated that 2 vessels will participate in this survey.
Figure 1.—Survey trackline on the continental shelf completed by the F/V *Continuity* during the 1991 eastern Bering Sea EINWT survey.
Figure 2.—Distribution of total sampling effort by the Alaska, Ocean Home 3, and Miller Freeman during the 1991 eastern Bering Sea trawl survey.
Figure 3.--Distribution of total sampling effort by the U.S.S.R. Research Vessel Novodrutsk during the 1991 Bering Sea trawl survey.